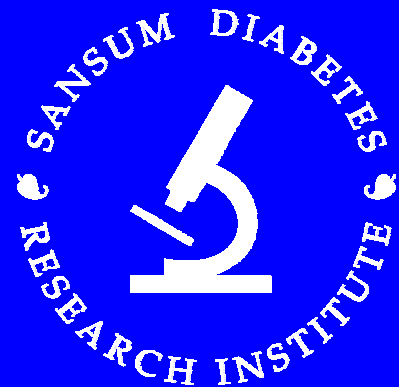


Breastfeeding & Diabetes

Successful Beginnings for a Healthy Future
Gestational Diabetes Conference

February 22, 2006

*David J. Pettitt, MD
Sansum Diabetes Research Institute
Santa Barbara, CA*



Breastfeeding & Diabetes

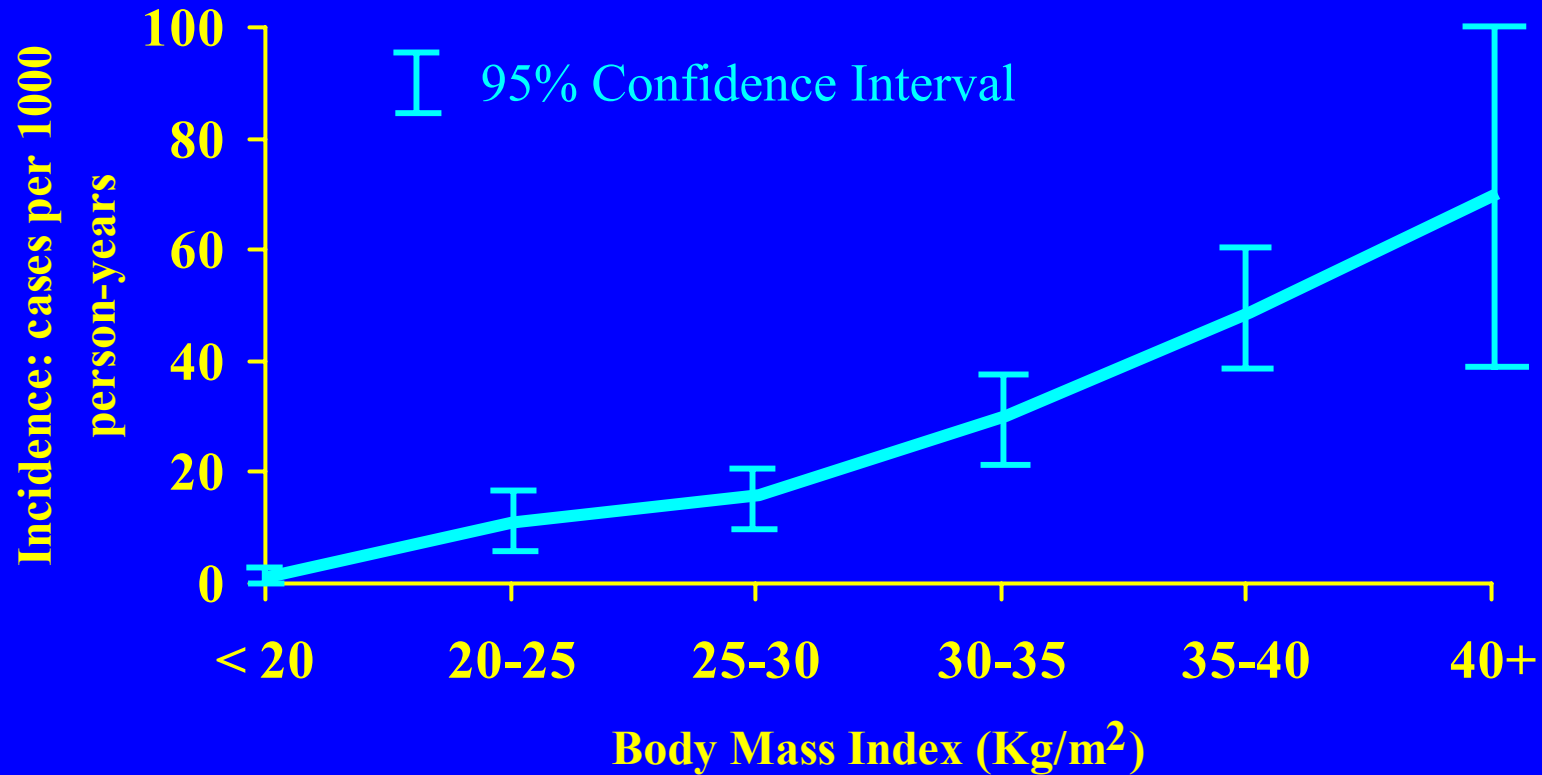
- Pima Indian Study
 - One of the first
 - Mainly offspring non-diabetic women
- Other studies – offspring of women with diabetes or GDM
- Recommendations
 - AAP guidelines
 - Cautions

Pima Indians of Arizona

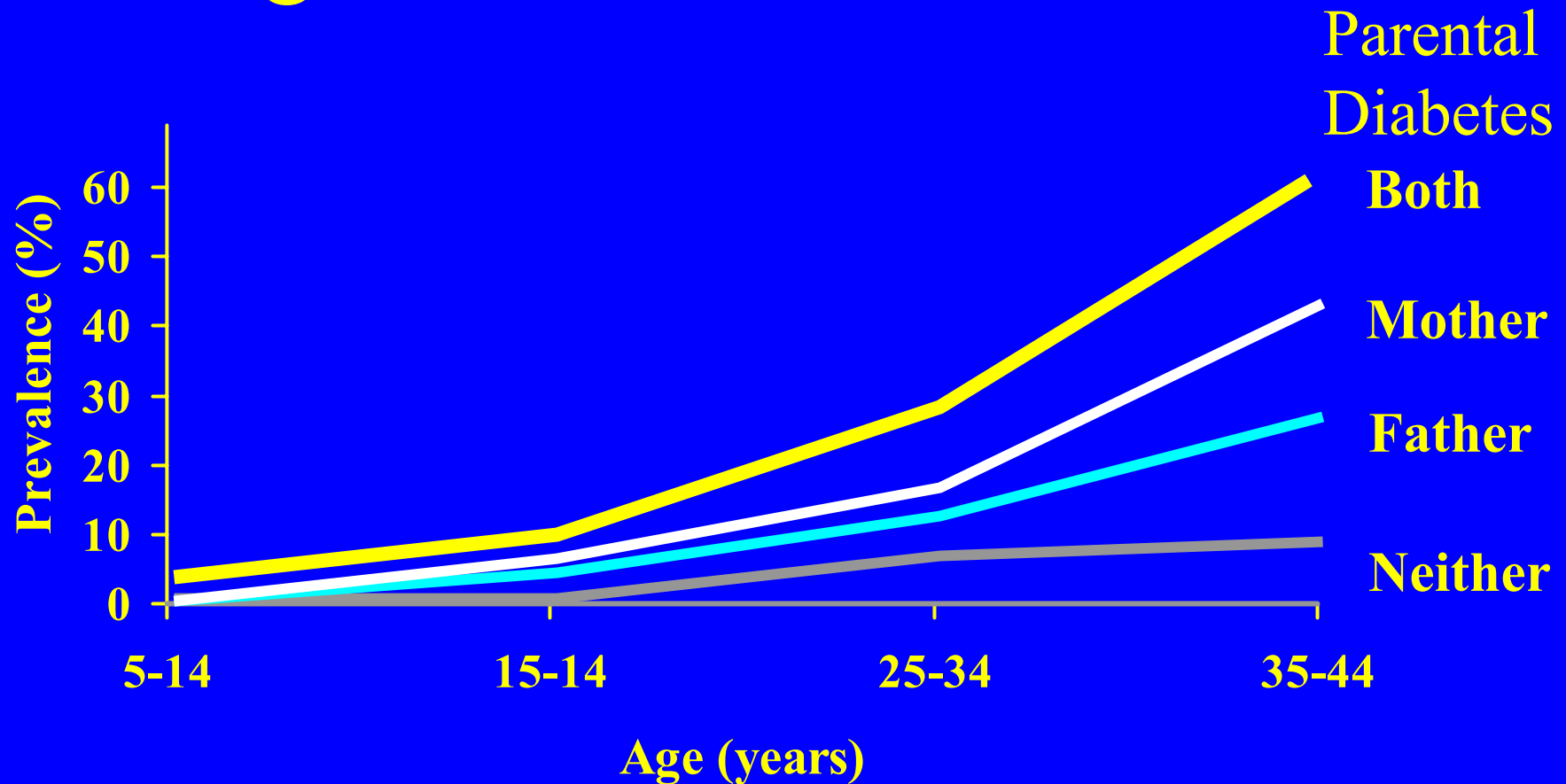
- High rates of type 2 diabetes
- Young age of onset
- Longitudinal study since 1965
- Children from age 5 years
- Oral glucose tolerance tests
 - Every 2 years
 - During pregnancy
- Height & weight
- Family database maintained



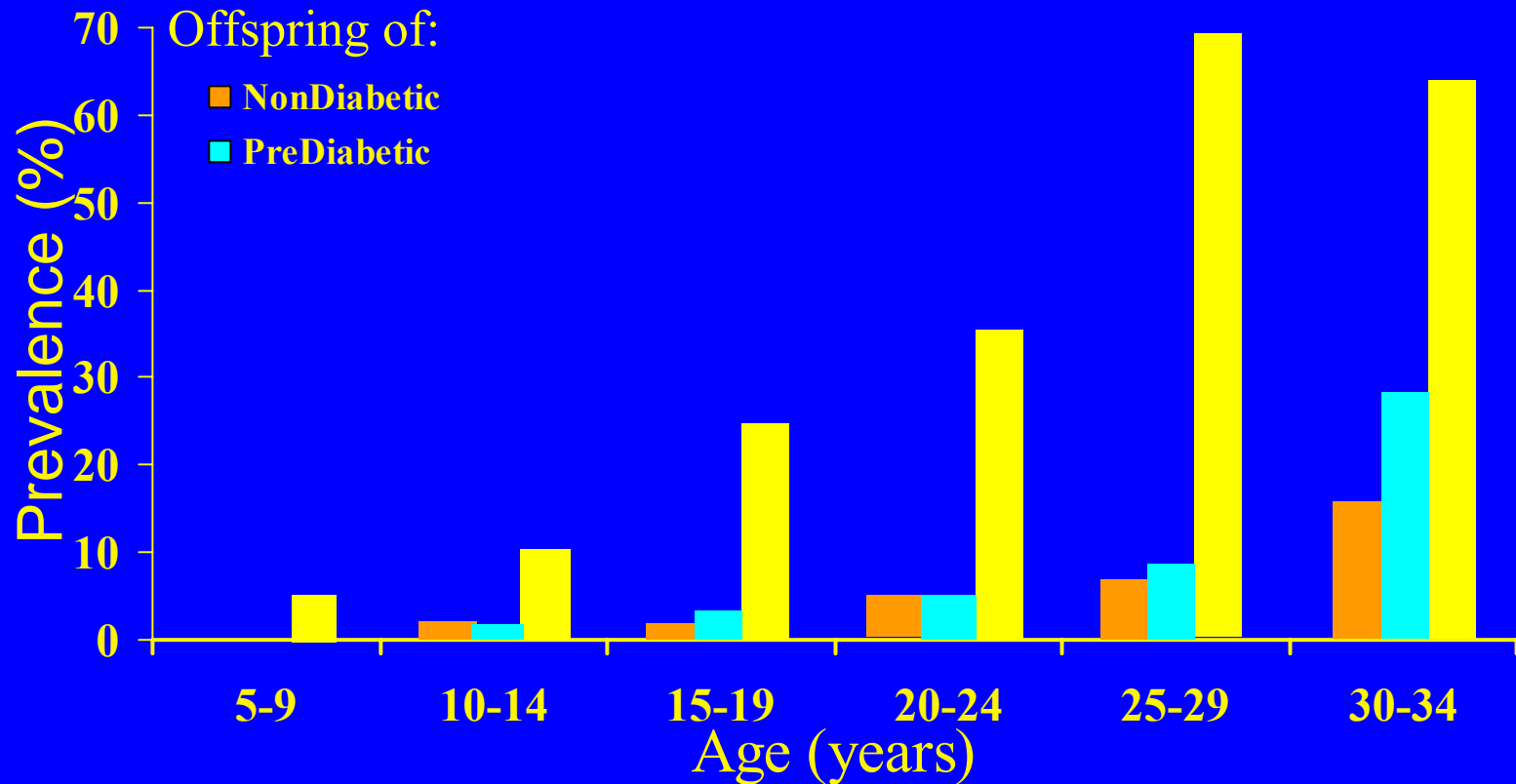
Age-adjusted Diabetes Incidence by Body Mass Index



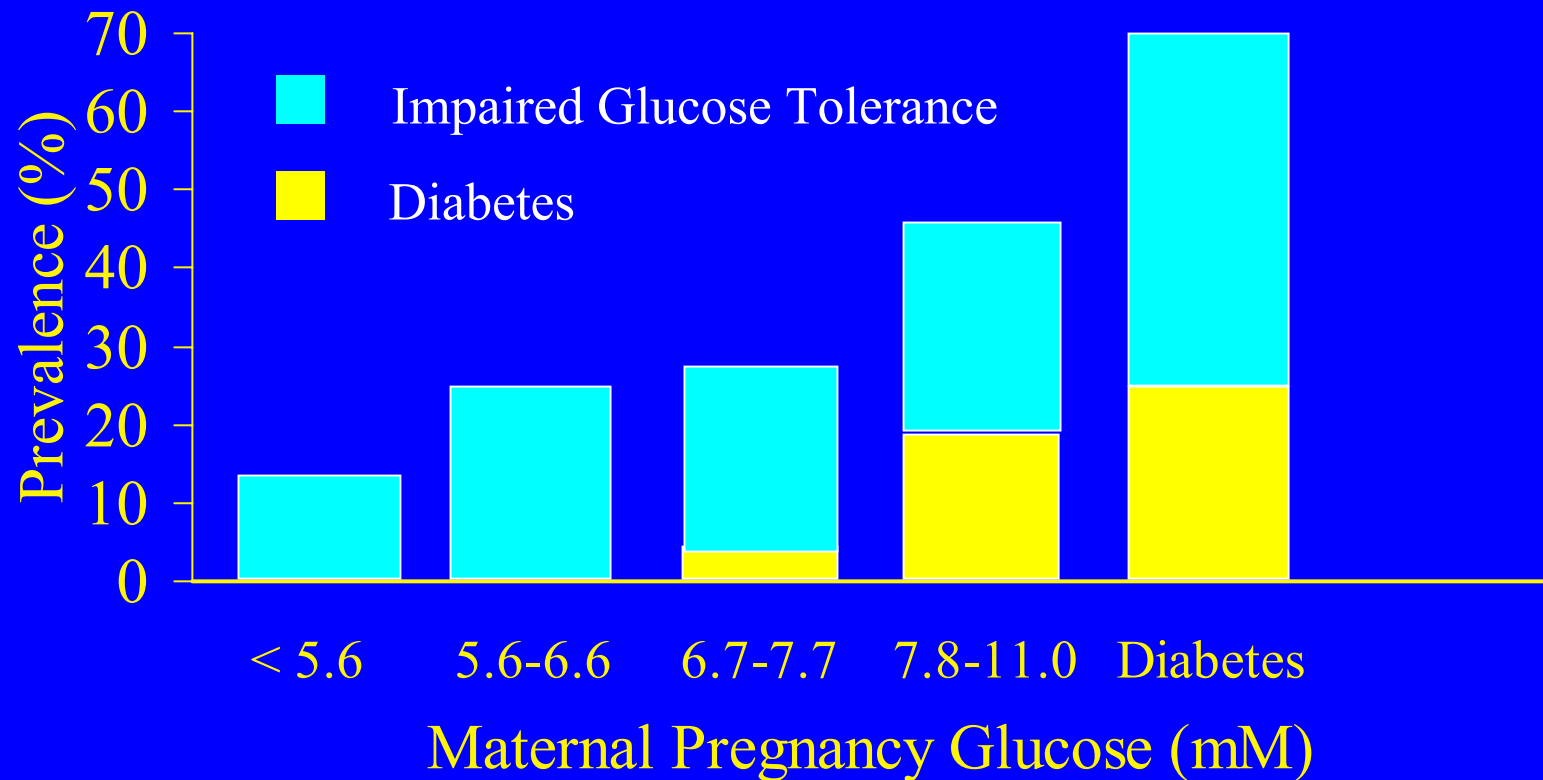
Prevalence of Diabetes by Age and Parental Diabetes



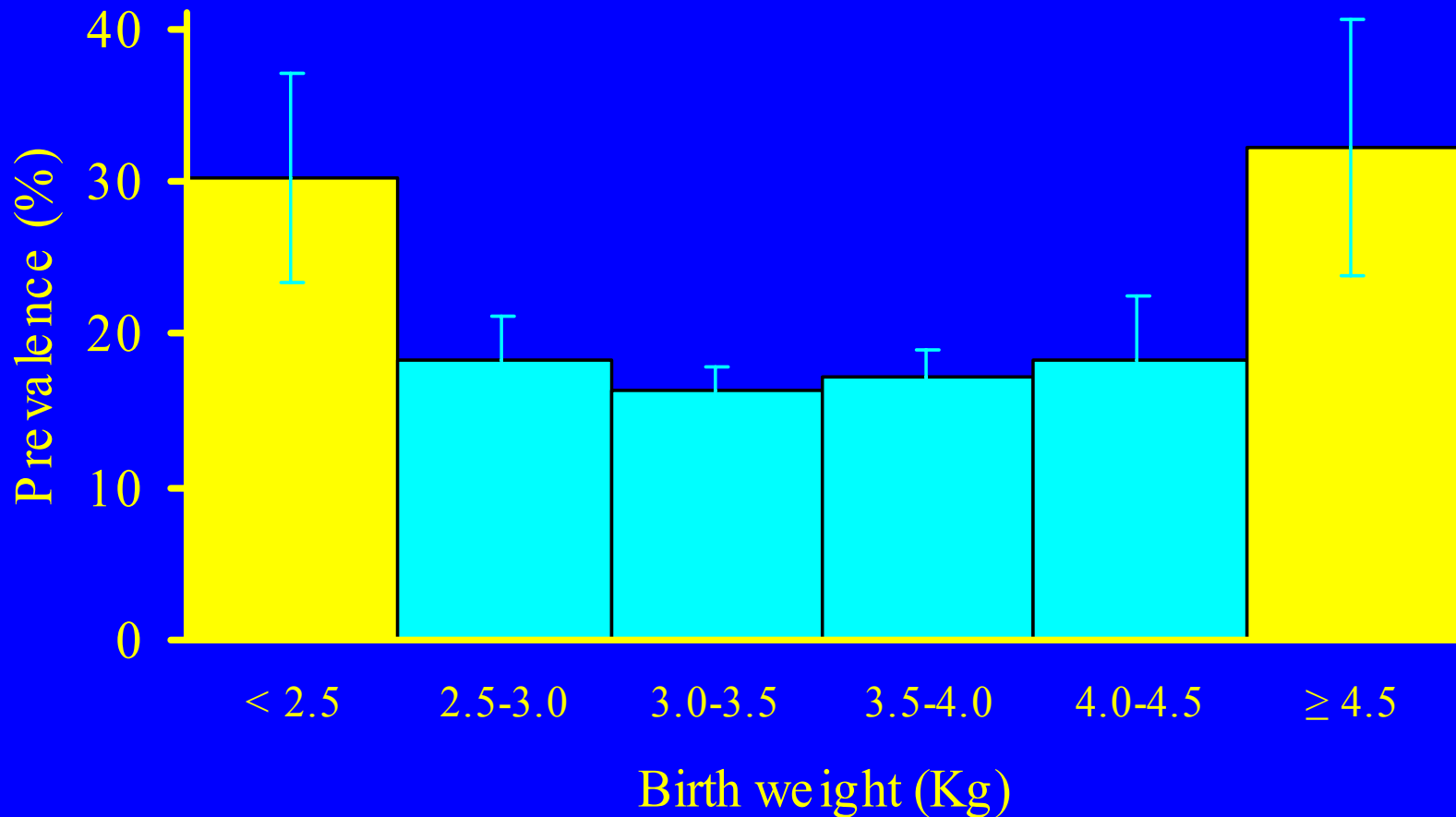
Prevalence of Diabetes by Maternal Diabetes During Pregnancy



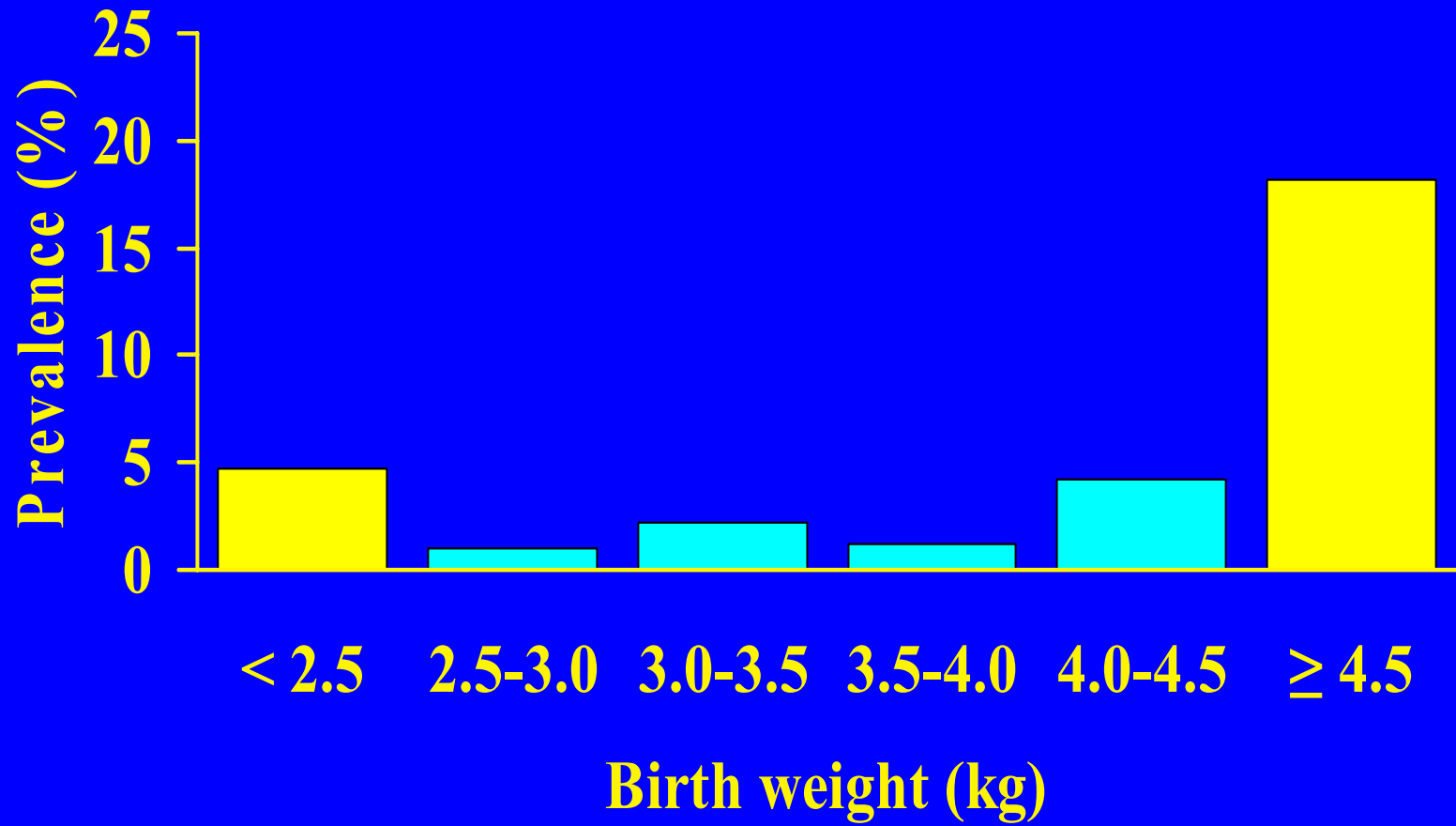
Abnormal GTT During Pregnancy According to The Mother's Pregnancy Glucose



Age-adjusted Diabetes Prevalence By Birth Weight (age 20-39 years)

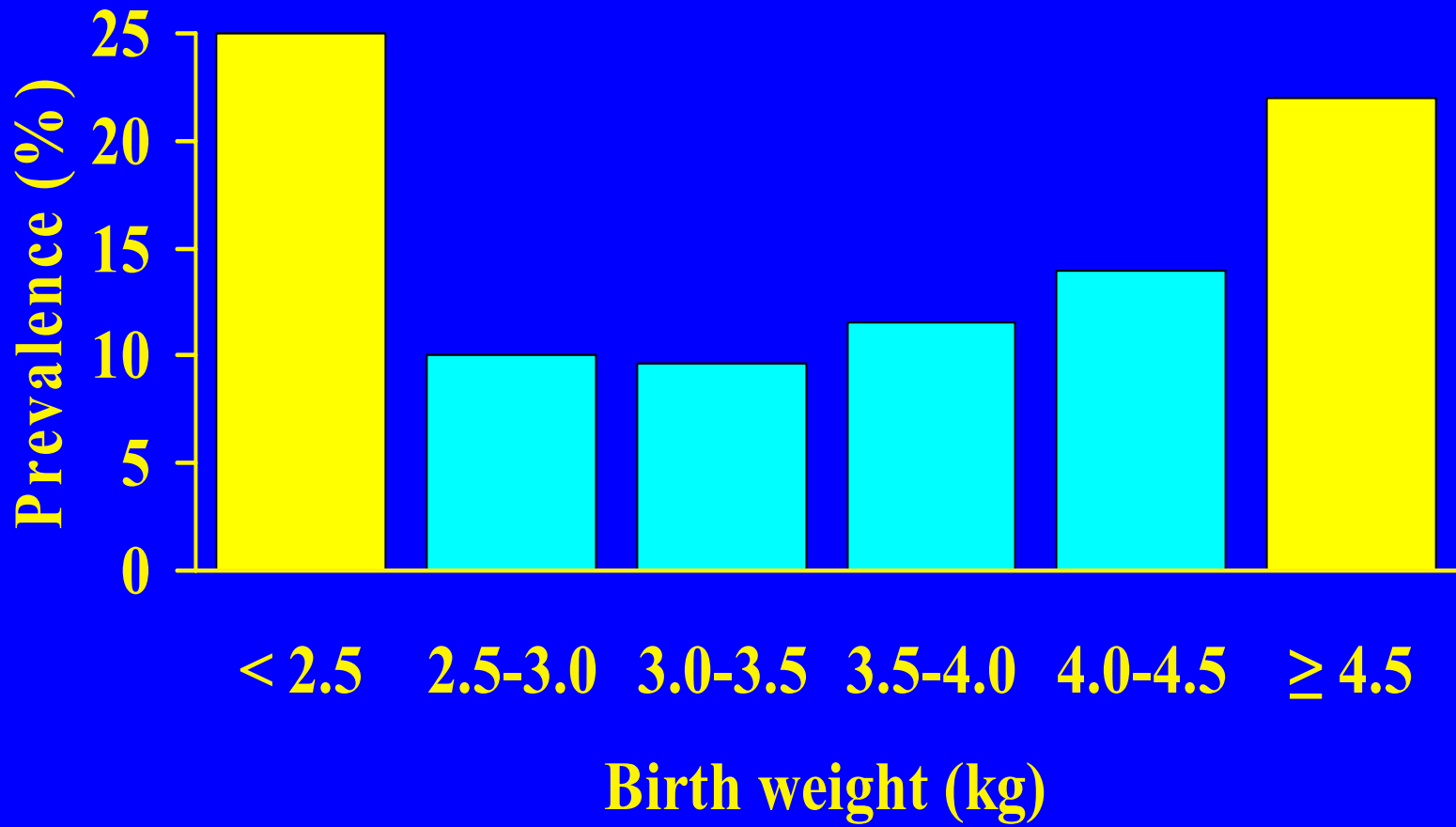


Prevalence of Diabetes by Birth Weight in 15-24 year old Pima Women During Pregnancy



Pettitt & Knowler, Diabetes Care, 1998

Prevalence of Diabetes by Birth Weight in 25-34 year old Pima Women During Pregnancy



Pettitt & Knowler, Diabetes Care, 1998

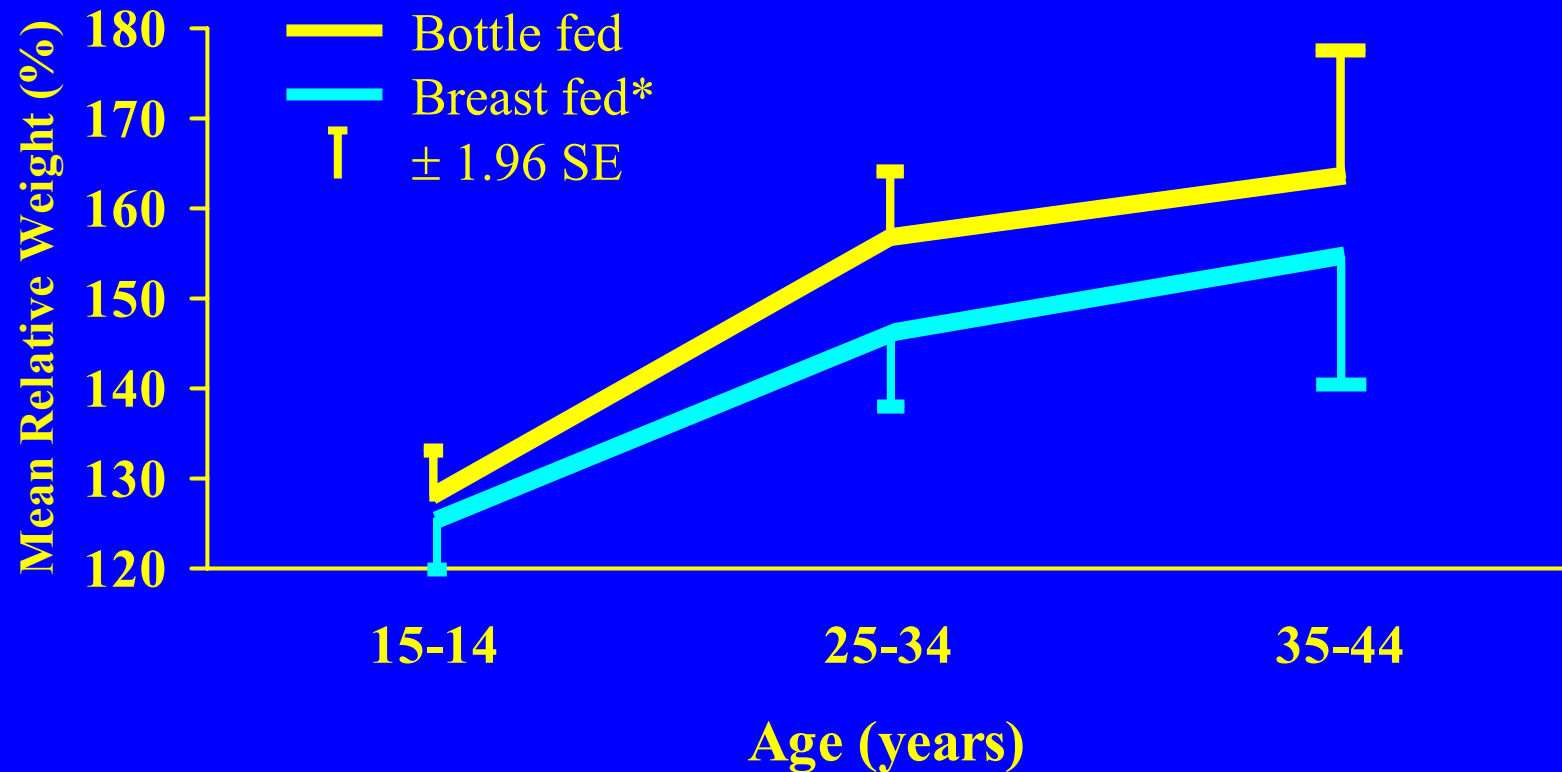
Breastfeeding and Diabetes

- Numerous studies linking Type 1 diabetes to early cow's milk consumption (several articles refute this association)
- Type 1 diabetes due to an autoimmune process
- Cow's milk protein similar to one of the Pancreatic β -cell peptides
- Type 2 diabetes NOT due to an autoimmune process

Pima Indian Infant Feeding Survey

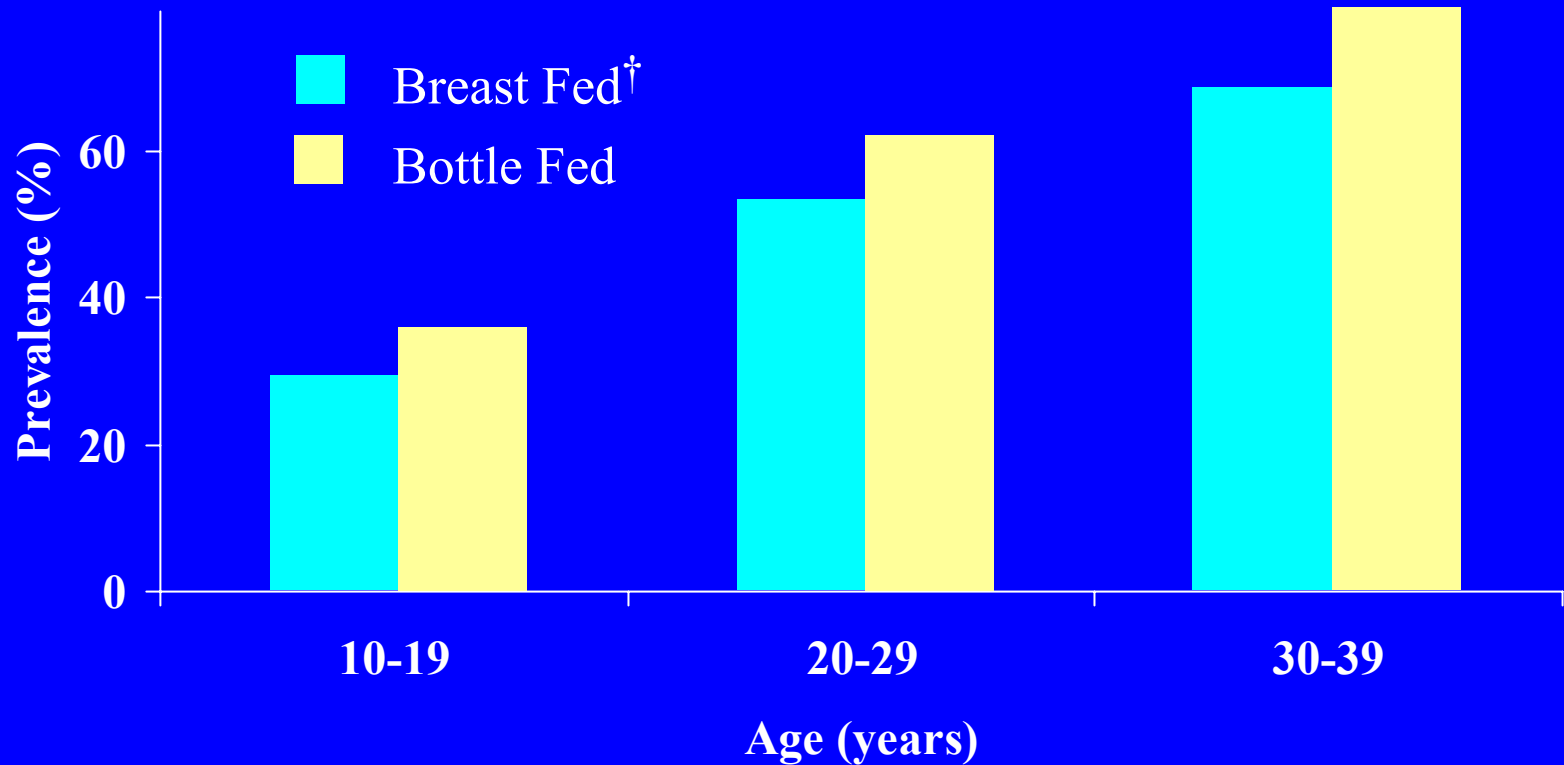
- 741 people born between 1950 and 1978
- Infant feeding data provided by mothers
- Examined \geq once between 10 and 39 years
 - Height
 - Weight
 - Glucose Tolerance

Mean Relative Weight by Feeding Type



* ≥ 2 months

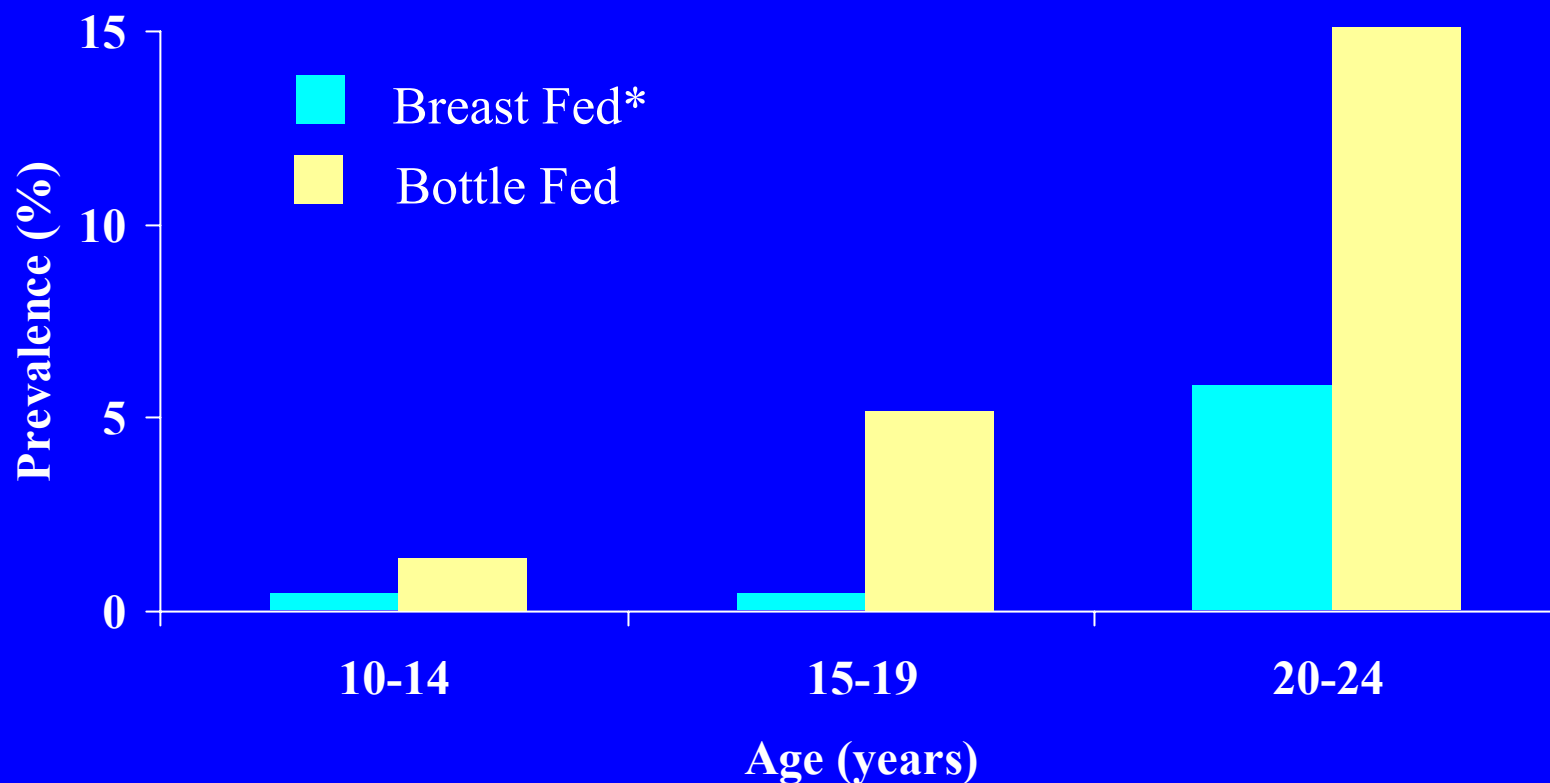
Prevalence of Obesity*by Infant Feeding



* Relative Weight $\geq 140\%$ of Standard

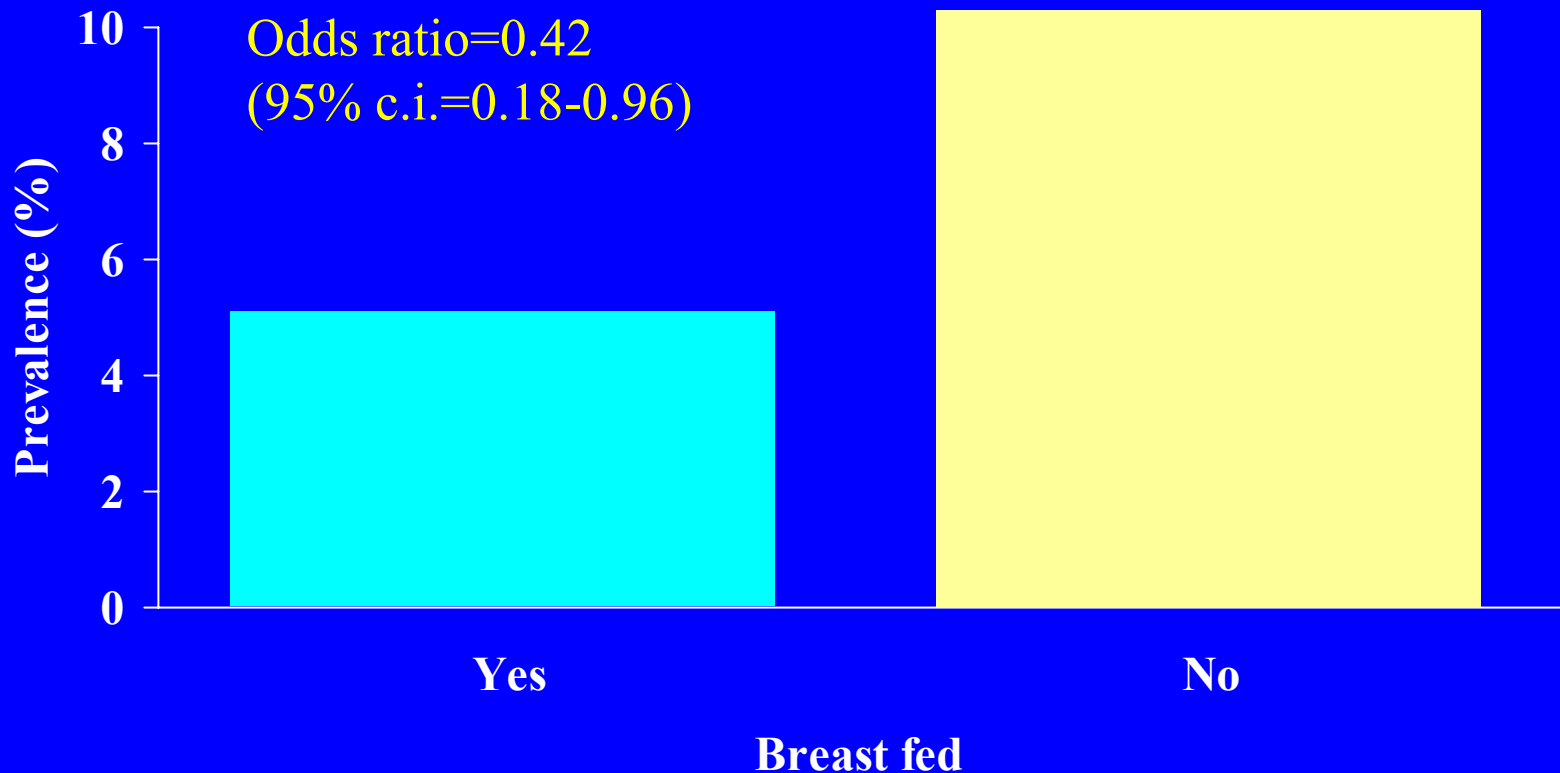
† ≥ 2 months

Prevalence of Diabetes by Infant Feeding



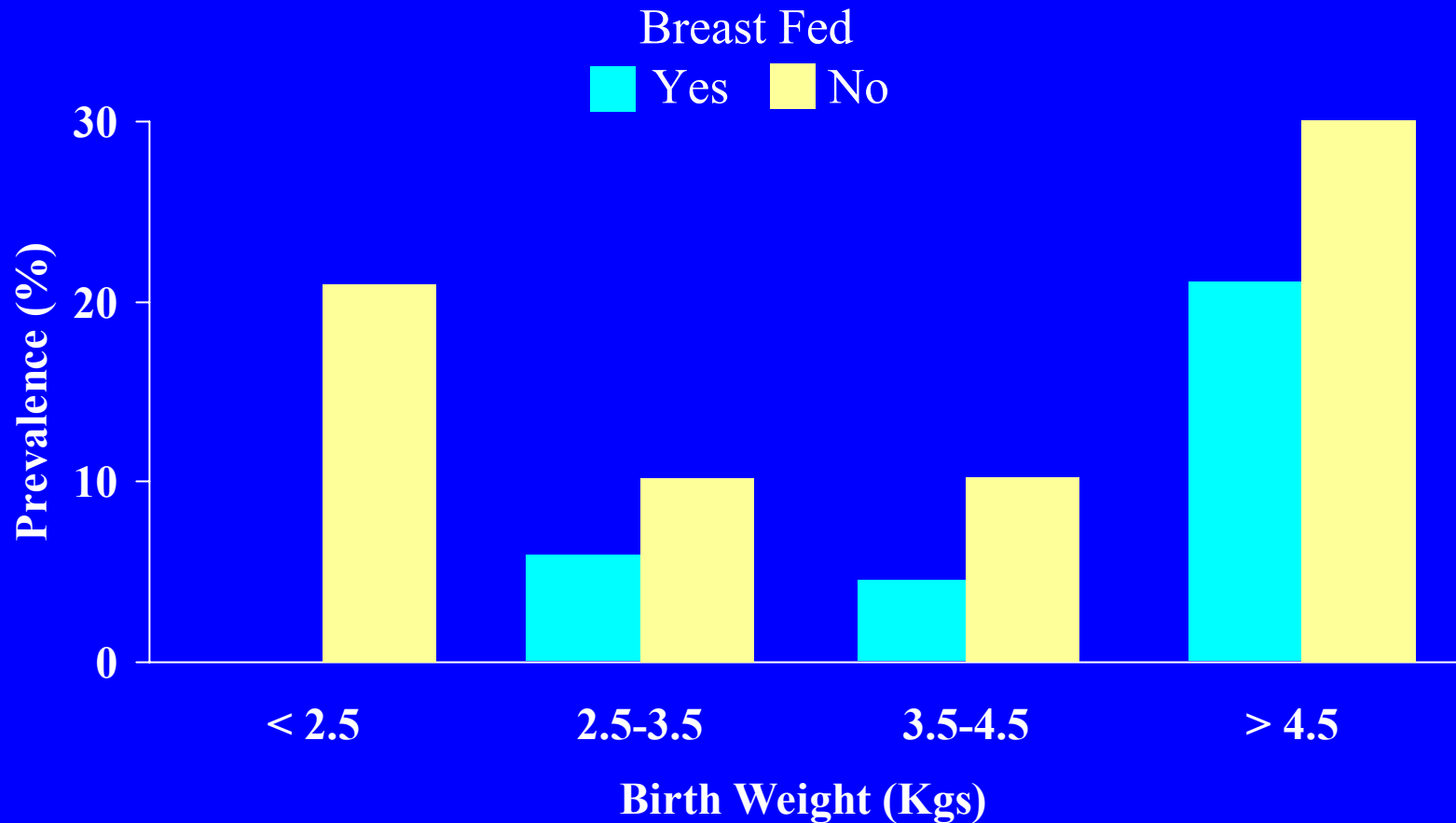
* ≥ 2 months

Adjusted* Prevalence of Diabetes



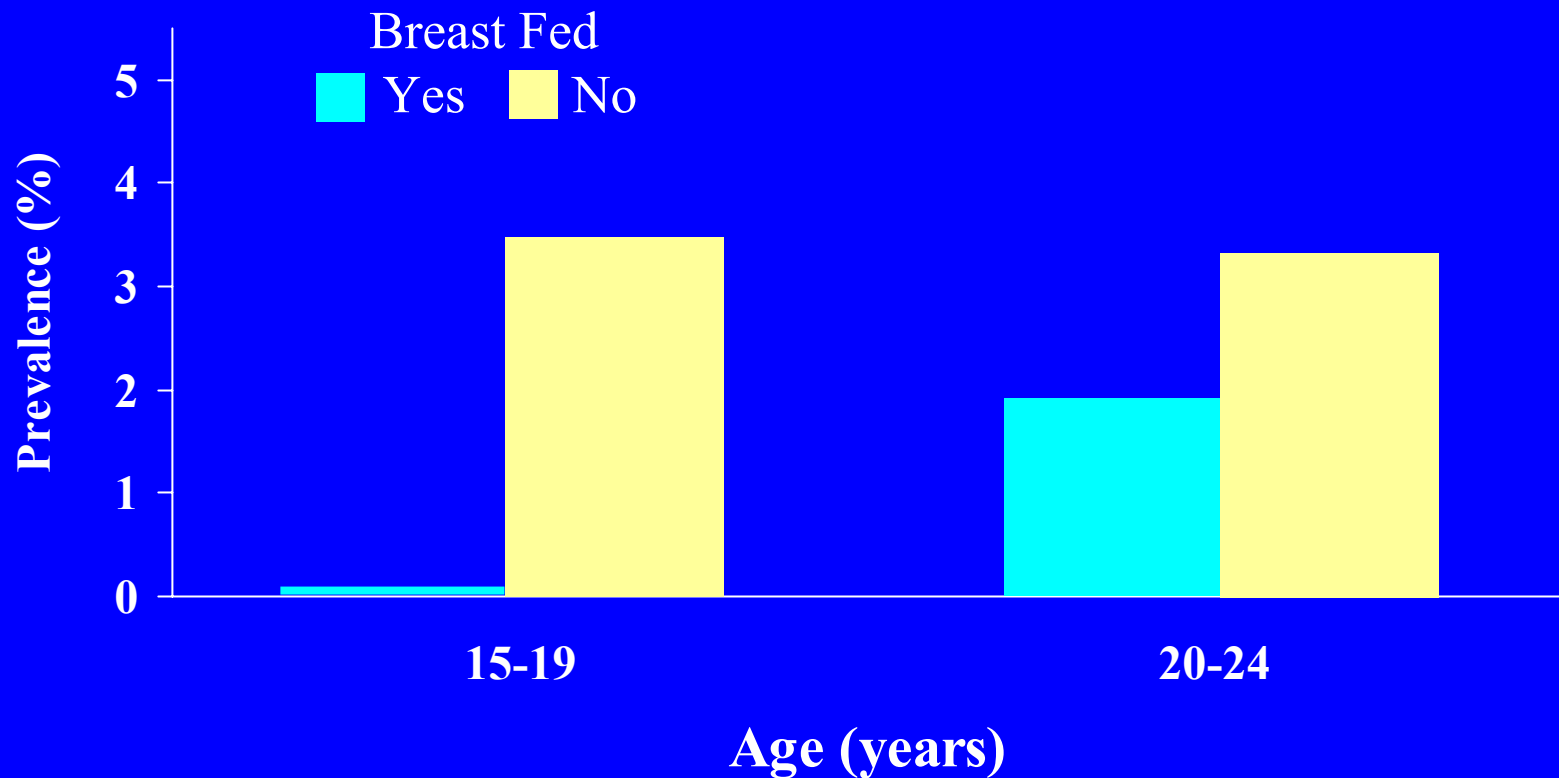
*Adjusted for age, birth date, sex, obesity, birth weight parental diabetes and maternal diabetes in pregnancy

Adjusted* Prevalence of Diabetes

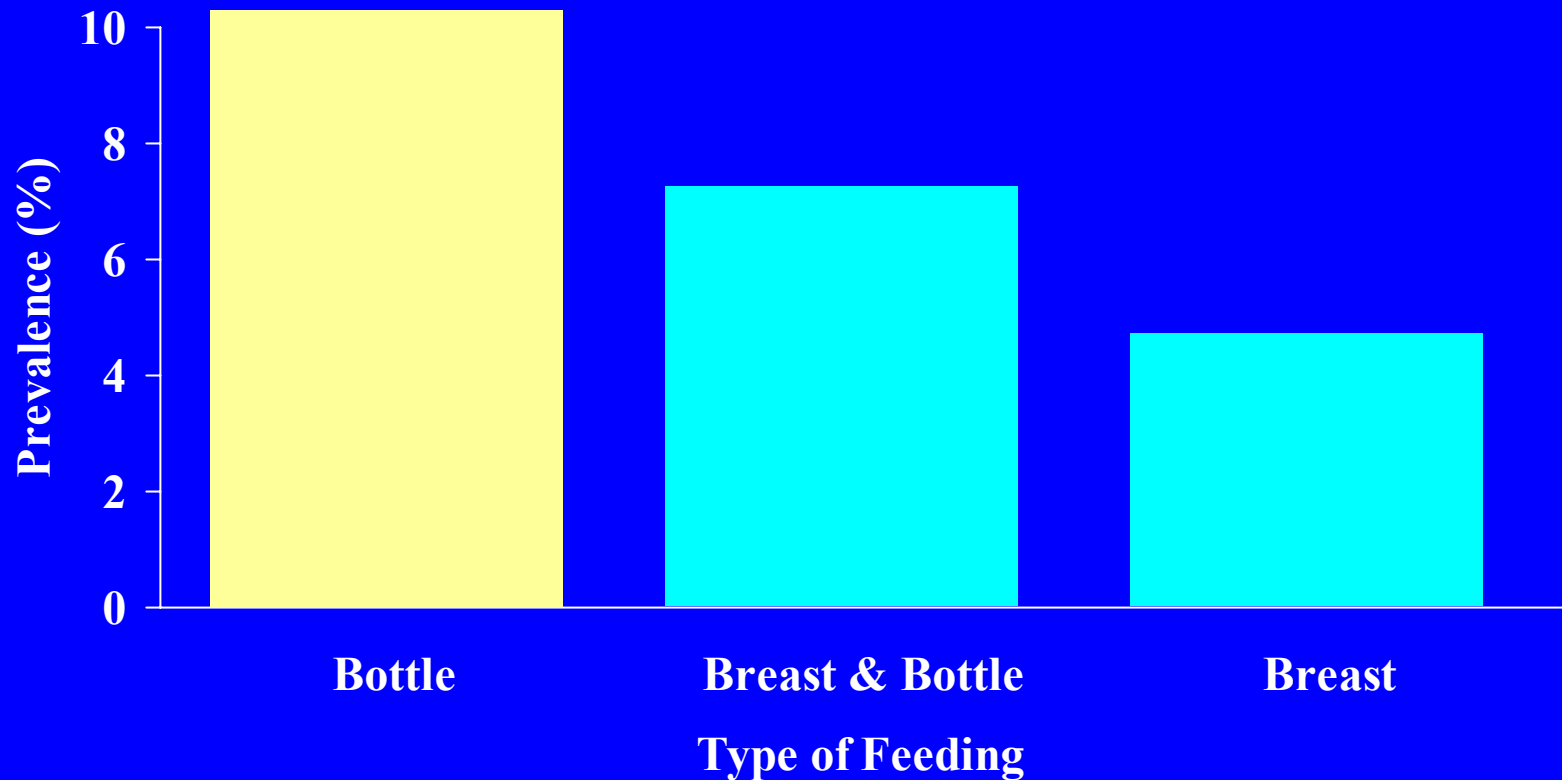


*Adjusted for age, sex, parental diabetes

Prevalence of Diabetes During Pregnancy

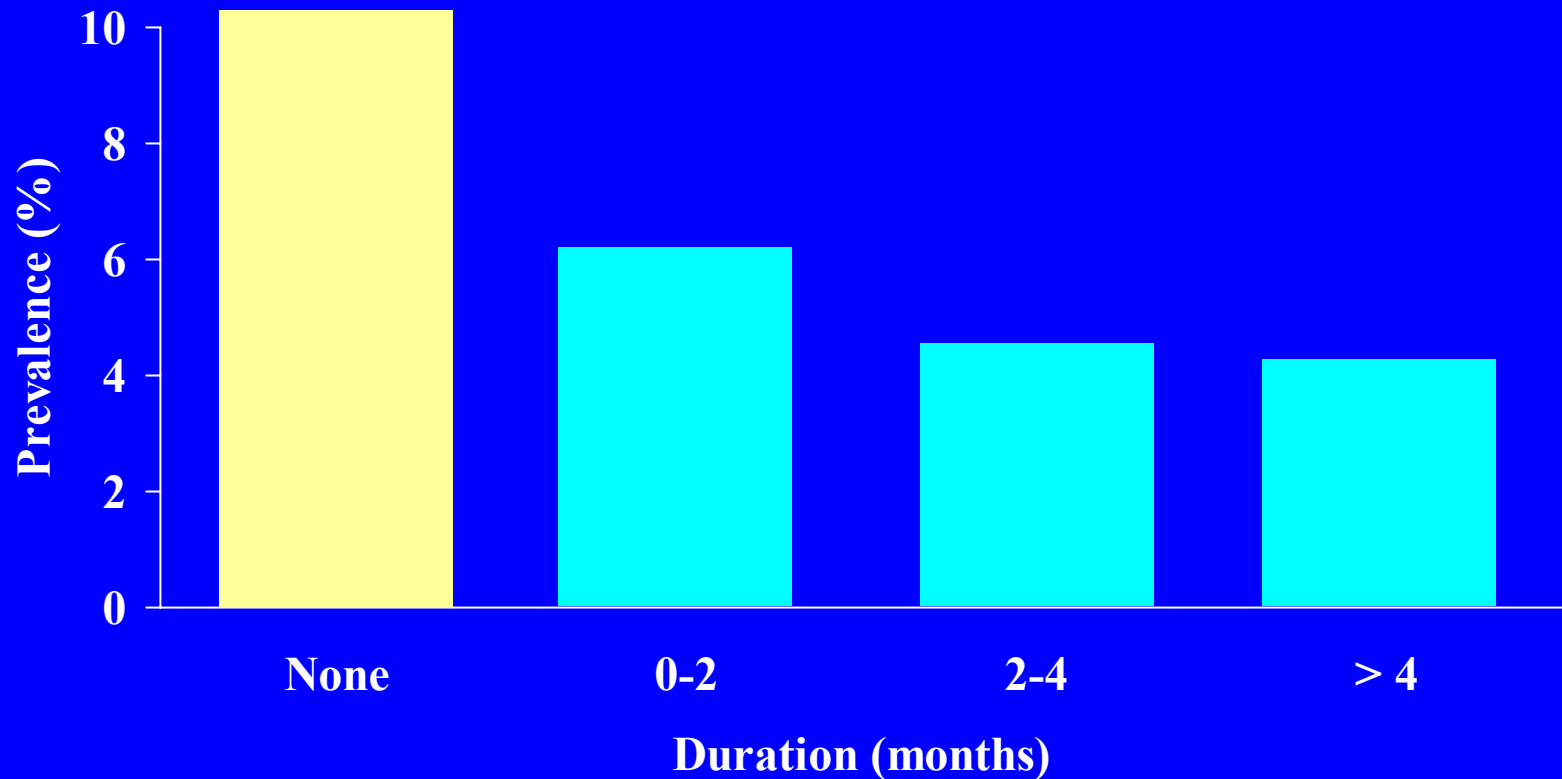


Adjusted Prevalence of Diabetes by Breast* and Bottle Feeding



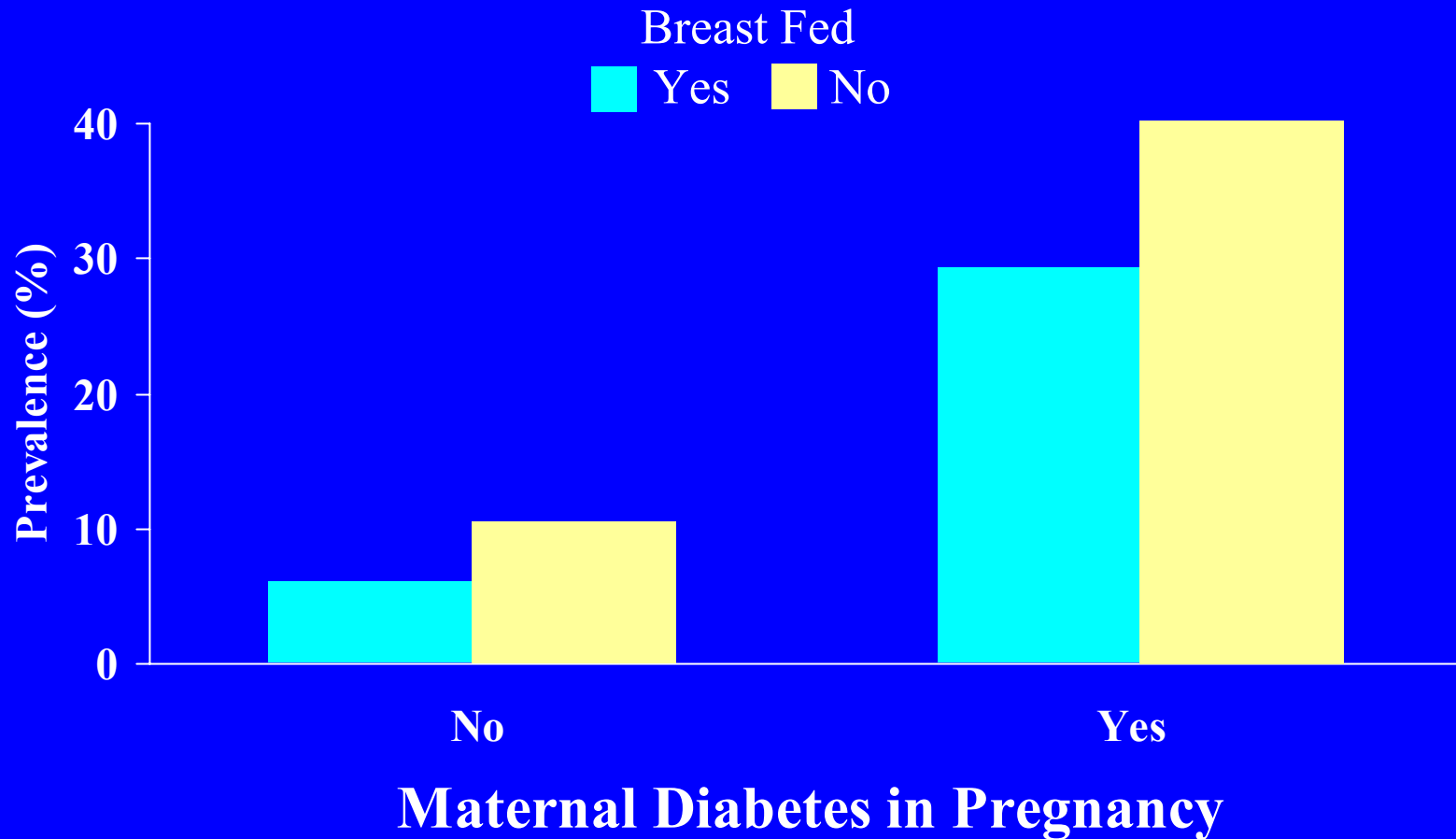
*** Breast feeding \geq 2 months**

Adjusted* Prevalence of Diabetes by Duration of Breastfeeding



*Adjusted for age, sex, birth weight, parental diabetes and maternal diabetes in pregnancy

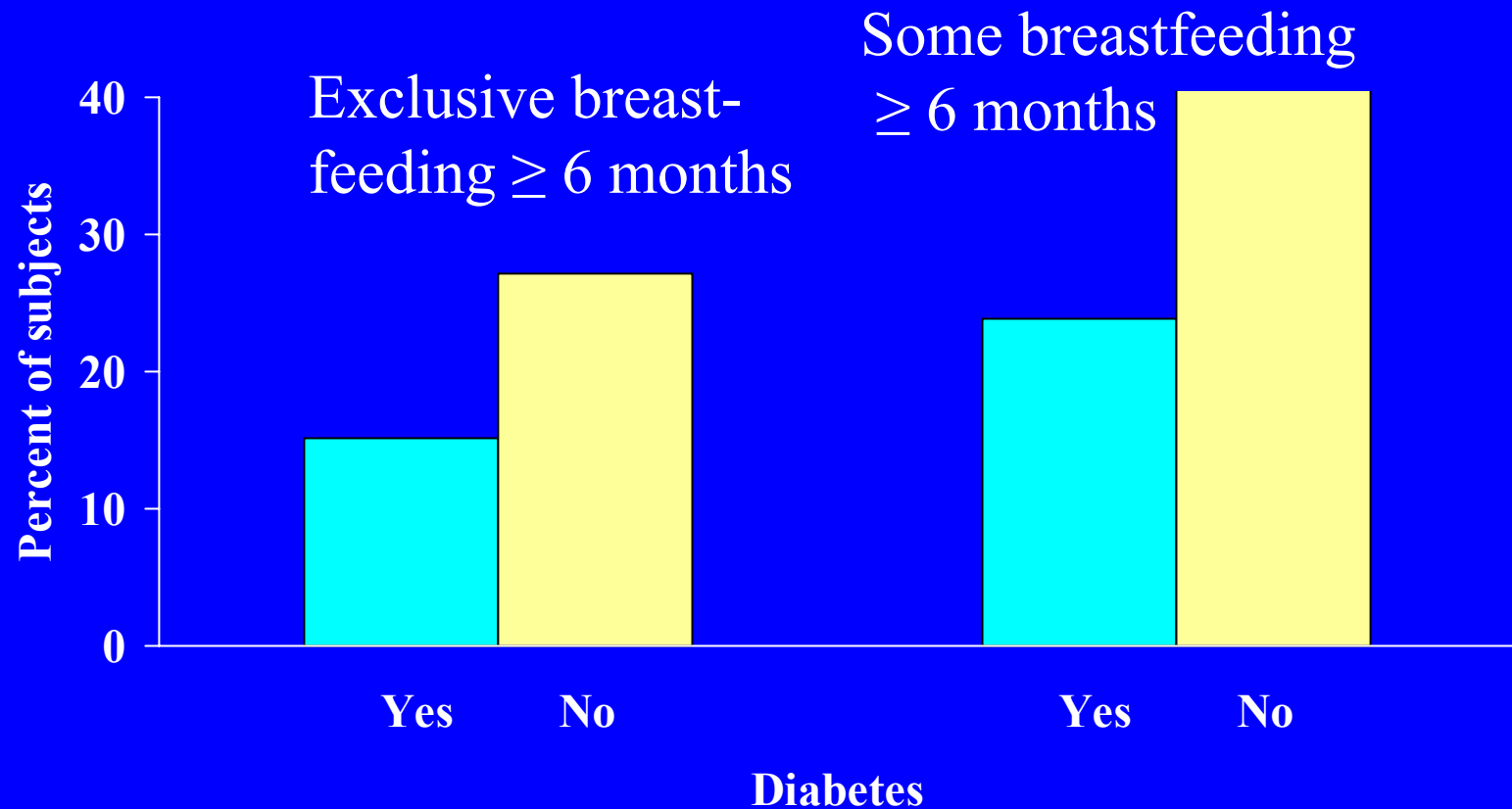
Adjusted* Prevalence of Diabetes



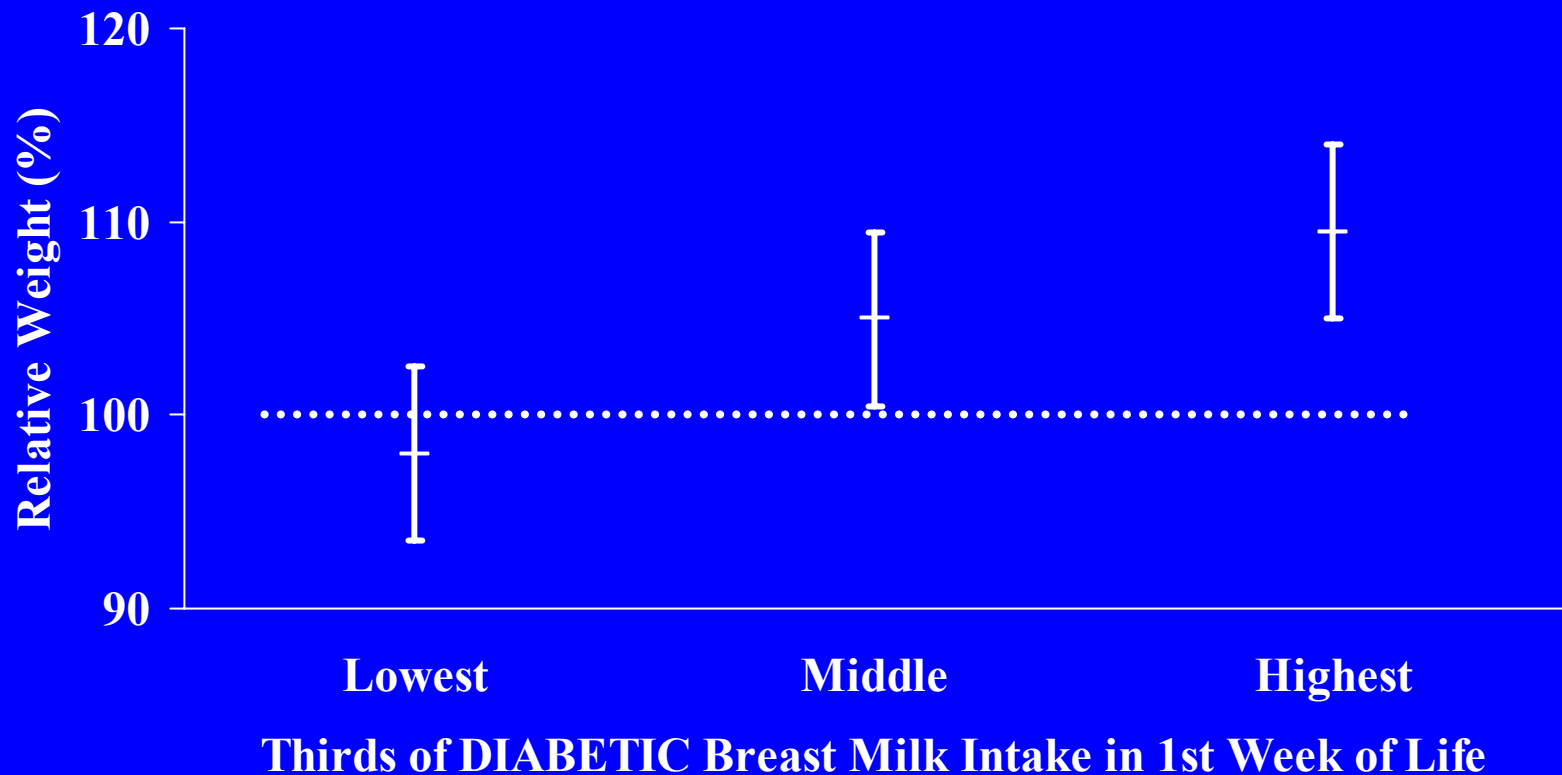
*Adjusted for age, birth date, sex, birth weight, parental diabetes

Other Studies

Type 2 Diabetes in Native Canadian Children < 18 years old



Relative weight at age 2 years by Thirds of Diabetic Breast Milk



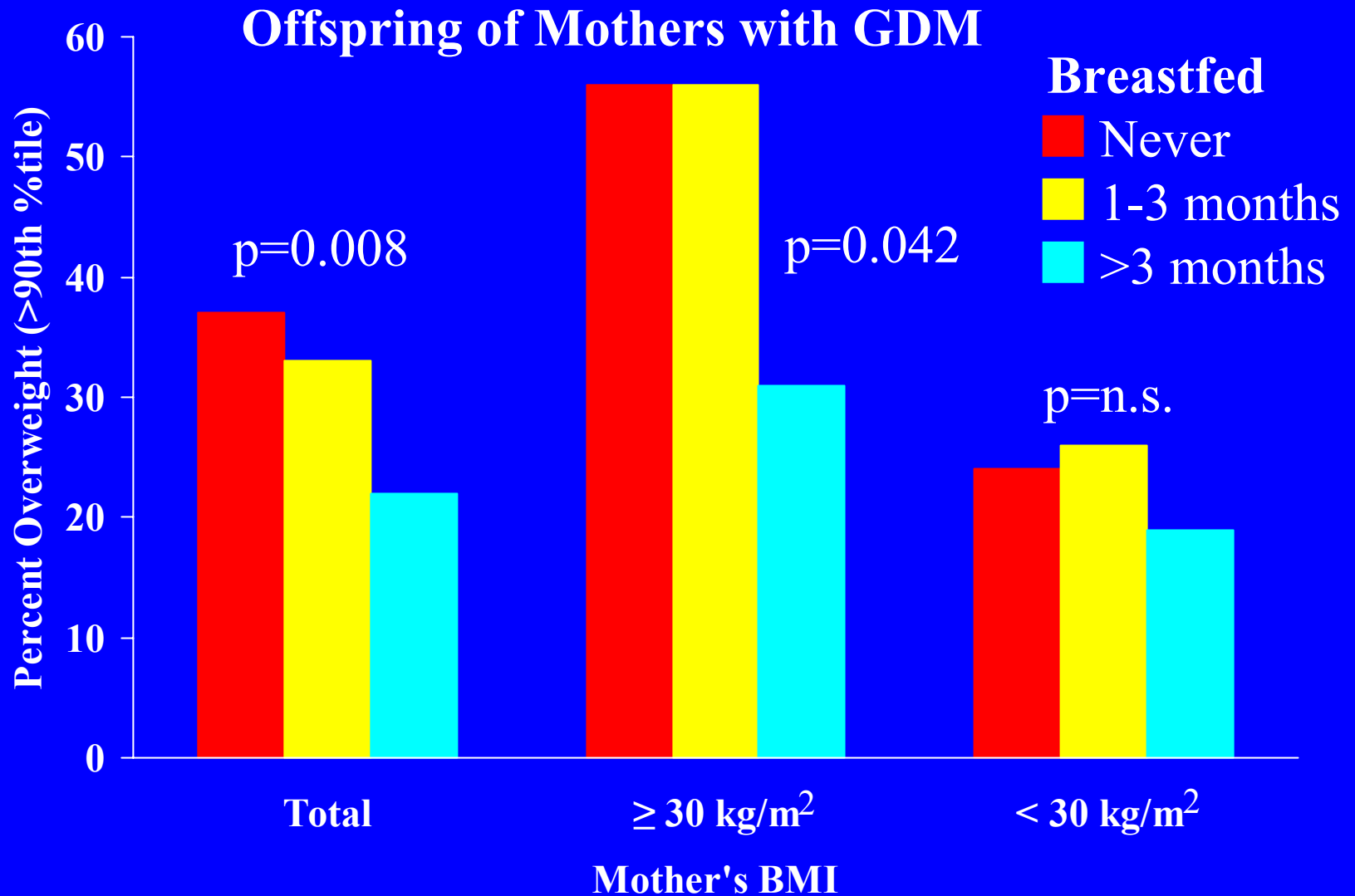
Relative weight at age 2 years by Thirds of Banked Breast Milk



Other Studies Addressing Breast Fed Infants of Diabetic Women

- Effect of breast milk of diabetic mothers on weight gain of the offspring in the first year of life. (Kerssen et al. European J Clin Nutr. 2004)
 - No difference in weight gain between exclusively breast fed and exclusively bottle fed children during the 1st year of life
 - Children who had mixed feedings gained ~ ½ kilogram more
- Glucose tolerance of 2 to 5 year old offspring of diabetic mothers. (Buinauskiene et al. Pediatr Diabetes 2004.)
 - Limited to offspring of women with type 1 diabetes
 - Significant positive correlation between duration of breast feeding and glucose concentration both fasting and 2 hours post load

Breastfeeding and Overweight in 5-1/2 year old



Schaefer-Graf UM et al. *Diabetes Care* (In Press)

With permission from the author

Duration of Lactation & Incidence of Type 2 Diabetes [in the Mothers]*

- Nurses' Health Study (83,585 women) & Nurses' Health Study II (73,418 women)
- Duration of lactation was inversely associated with risk of type 2 diabetes
- Effect waned over time – by 15 years since last birth there was no longer any effect
- Among women with a history of GDM, lactation did not affect risk of subsequent type 2 diabetes
- Confirms previous smaller studies of GDM

*Stuebe AM *et al.* JAMA 2005

Summary

- Among offspring
 - Breastfeeding associated with less obesity and type 2 diabetes among offspring of non-diabetic women
 - This benefit seems to occur only with breastfeeding during the first few months of life
 - Breast feeding may not prevent obesity or diabetes and may be detrimental for offspring of women with diabetes
 - However, most studies small and data on the mother's concurrent glucose control are lacking.
- Among women
 - Breastfeeding decreases risk of developing type 2 diabetes for up to 15 years
 - Women with GDM do not get this benefit

Conclusion

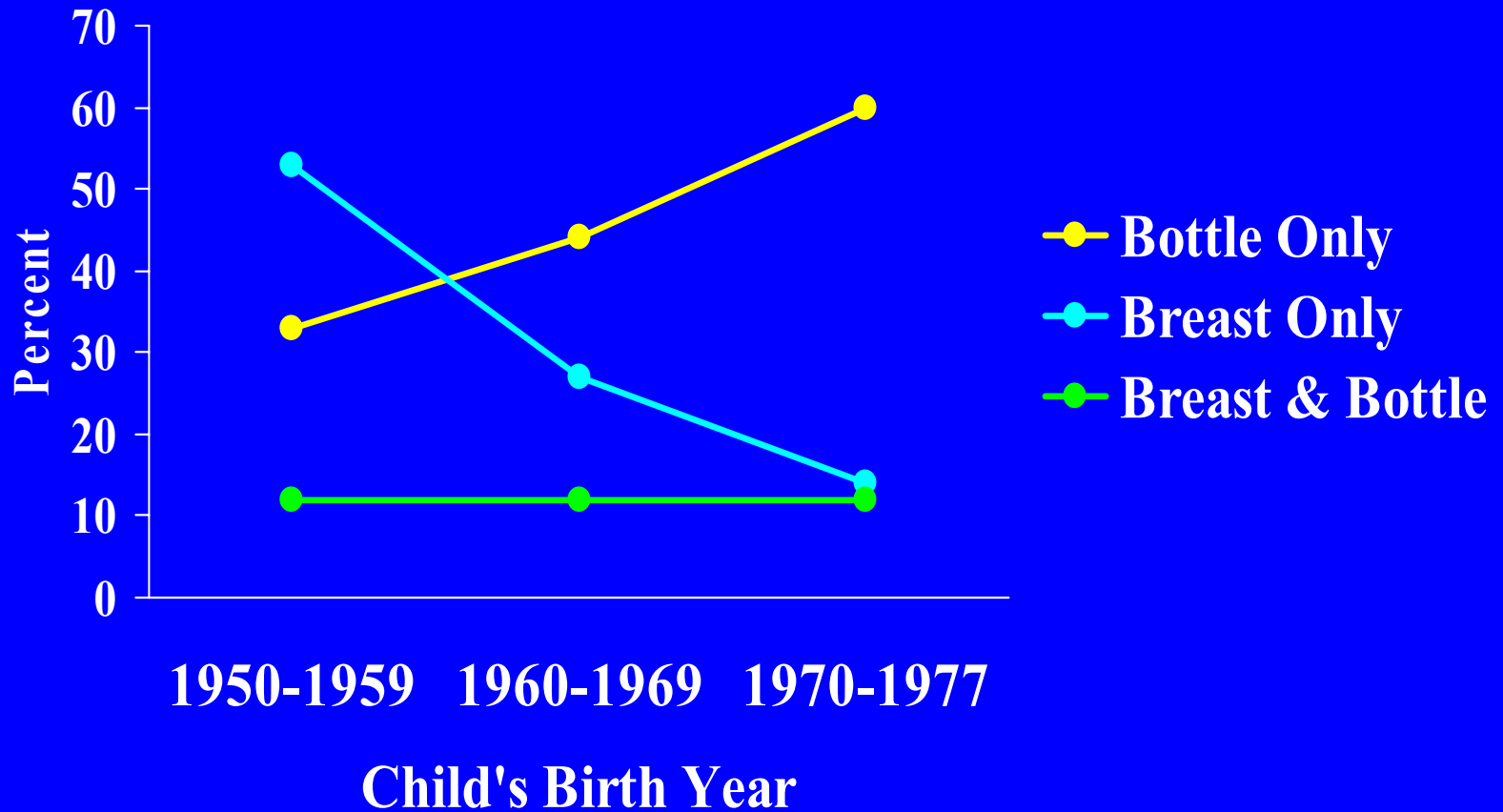
- The lasting beneficial effects of breastfeeding appear to be lifelong for the offspring
- Careful attention should be paid to the glucose control of the postpartum woman with diabetes or GDM if she breastfeeds
- Waiting until diabetes is diagnosed at the 6-week postpartum visit is too late
- Weight gain in the offspring of women with diabetes should be closely monitored regardless of feeding method

Recommendations

- Breastfeeding is the best way to nurture healthy newborns of healthy mothers
- Prevention of overweight and diabetes is only one of many benefits of breastfeeding
- AAP recommends breastfeeding $\geq 1^{\text{st}}$ year
- The data are insufficient to suggest any modification of the AAP recommendation for the offspring of women with diabetes



Infant Feeding Type by Birth Year

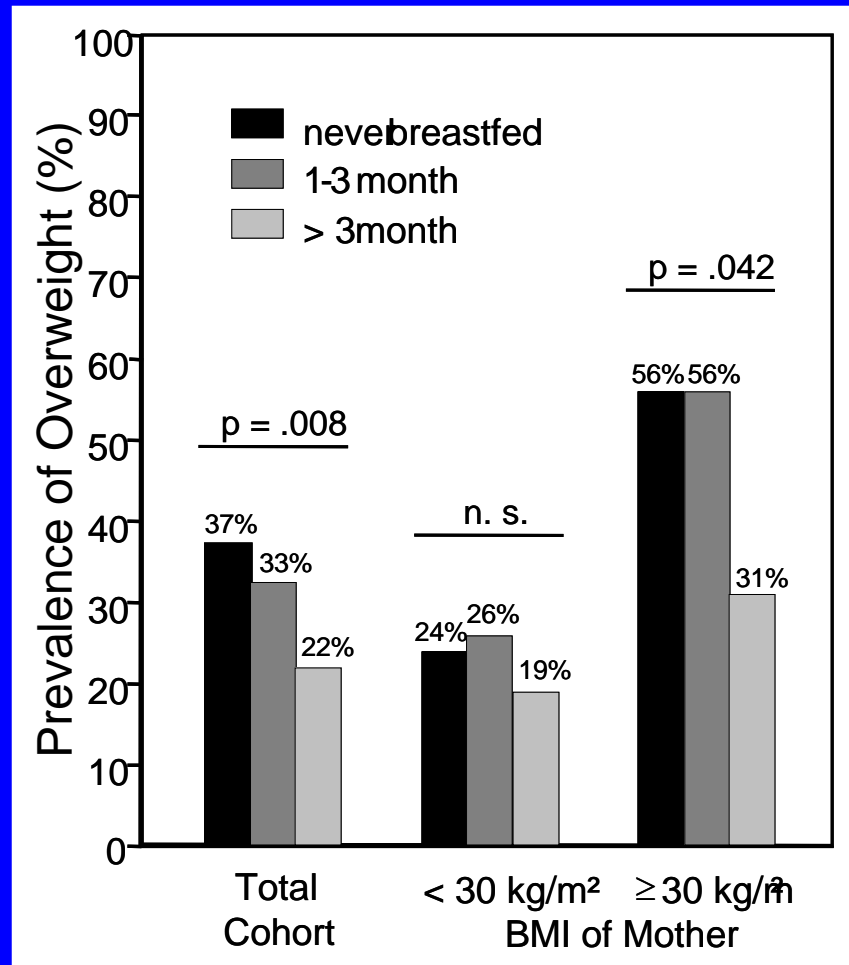


“Breast feeding Children of Mothers with GDM”*

- Breastfeeding for ≥ 3 months was associated with less overweight
- Effect limited to offspring of obese women
- Prevalence of overweight was markedly higher than in age-correspondent normal
- Kg/m²

*Shaefer-Graf UM. *et al.* Article in press in Diabetes Care

Prevalence of BMI>90th percentile by duration of breastfeeding and BMI of the mother*



*Schaefer-Graf UM. et al. Diabetes Care (In Press)